Claims

[c1] A physical vapor deposition apparatus comprising:
a coating chamber;
means for providing at least two passages through which at least two materials are fed into the coating chamber, at least a first of the materials having a composition with a higher vapor pressure than a second of the materials;
means for melting the first and second materials to form molten pools thereof, the melting means being operable to melt the first and second materials at different rates; and
means for suspending an article within the coating chamber, the suspending means transporting the article within the coating chamber relative to the two molten pools so as to deposit a coating on the article with a controlled composition that is a mixture of the first and second materials.

[c2] A physical vapor deposition apparatus according to claim 1, wherein the providing means is a crucible in which the two passages are defined.

[c3] A physical vapor deposition apparatus according to claim 1, wherein the melting means comprises an electron beam or a laser beam.

[c4] A physical vapor deposition apparatus according to claim 1, wherein the melting means is a single electron beam that is sequentially projected on each of the first and second materials.

[c5] A physical vapor deposition apparatus according to claim 1, wherein the melting means projects a first electron beam on the first material and a second electron beam on the second material.

[c6] A physical vapor deposition apparatus according to claim 1, wherein the two materials are in the form of ingots.

[c7] A physical vapor deposition apparatus according to claim 1, wherein the first material is in the form of an ingot and the second material is in the form of a wire.

[c8] A physical vapor deposition apparatus according to claim 1, wherein the first

material comprises beta-NiAl.

[c9] A physical vapor deposition apparatus according to claim 8, wherein the first material further comprises at least one element chosen from the group consisting of chromium, titanium, tantalum, silicon, gallium, calcium and iron.

[c10] A physical vapor deposition apparatus according to claim 8, wherein the first material further comprises chromium.

[c11] A physical vapor deposition apparatus according to claim 8, wherein the second material is chosen from the group consisting of zirconium, hafnium, yttrium and cerium.

[c12] A physical vapor deposition apparatus according to claim 1, wherein the second material is chosen from the group consisting of zirconium, hafnium, yttrium and cerium.

[c13] An electron beam physical vapor deposition apparatus comprising:
a coating chamber;
a crucible having at least two passages through which at least two materials are fed into the coating chamber, a first of the two materials being an ingot of a beta-NiAl alloy containing chromium, a second of the two materials comprising at least one element chosen from the group consisting of zirconium, hafnium, yttrium and cerium, such that the first material has a higher vapor pressure than the second material;
means for generating at least one electron beam for melting the first and second materials to form molten pools thereof, the generating means being operable to melt the first and second materials at different rates; and
means for suspending an article within the coating chamber, the suspending means transporting the article within the coating chamber relative to the two molten pools so as to deposit a coating on the article with a controlled composition that is a mixture of the first and second materials.

[c14] A physical vapor deposition apparatus according to claim 13, wherein the generating means generates a single electron beam that is sequentially projected on each of the first and second materials.

[c15] A physical vapor deposition apparatus according to claim 13, wherein the generating means projects a first electron beam on the first material and a second electron beam on the second material.

[c16] A physical vapor deposition apparatus according to claim 13, wherein the second material is in the form of an ingot.

[c17] A physical vapor deposition apparatus according to claim 13, wherein the second material is in the form of a wire.

[c18] A physical vapor deposition process comprising the steps of:
providing at least two passages through which at least two materials are fed into a coating chamber of a physical vapor deposition apparatus, at least a first of the materials having a composition with a higher vapor pressure than a second of the materials;
melting the first and second materials to form molten pools thereof, the first and second materials being melted at different rates; and
suspending an article within the coating chamber and transporting the article relative to the two molten pools so as to deposit a coating on the article with a controlled composition that is a mixture of the first and second materials.

[c19] A physical vapor deposition process according to claim 18, wherein the two passages are defined by a crucible.

[c20] A physical vapor deposition process according to claim 18, wherein the first and second materials are melted with an electron beam or a laser beam.

[c21] A physical vapor deposition process according to claim 18, wherein the first and second materials are melted with a single electron beam that is sequentially projected on each of the first and second materials.

[c22] A physical vapor deposition process according to claim 18, wherein the first and second materials are melted by a first electron beam projected on the first material and a second electron beam projected on the second material.

[c23] A physical vapor deposition process according to claim 18, wherein the two materials are in the form of ingots.

[c24] A physical vapor deposition process according to claim 18, wherein the first material is in the form of an ingot and the second material is in the form of a wire.

[c25] A physical vapor deposition process according to claim 18, wherein the first material comprises beta-NiAl.

[c26] A physical vapor deposition process according to claim 25, wherein the first material further comprises at least one element chosen from the group consisting of chromium, titanium, tantalum, silicon, gallium, calcium and iron.

[c27] A physical vapor deposition process according to claim 25, wherein the first material further comprises chromium.

[c28] A physical vapor deposition process according to claim 25, wherein the second material is chosen from the group consisting of zirconium, hafnium, yttrium and cerium.

[c29] A physical vapor deposition process according to claim 18, wherein the second material is chosen from the group consisting of zirconium, hafnium, yttrium and cerium.

[c30] An electron beam physical vapor deposition process comprising the steps of:
providing a crucible having at least two passages through which at least two materials are fed into a coating chamber, a first of the two materials being an ingot of a beta-NiAl alloy containing chromium, a second of the two materials comprising at least one element chosen from the group consisting of zirconium, hafnium, yttrium and cerium, such that the first material has a higher vapor pressure than the second material;
generating at least one electron beam to melt the first and second materials and form molten pools thereof, the first and second materials being melted at different rates; and
suspending an article within the coating chamber and transporting the article relative to the two molten pools so as to deposit a coating on the article with a controlled composition that is a mixture of the first and second materials.

[c31] An electron beam physical vapor deposition process according to claim 30, wherein the generating means generates a single electron beam that is sequentially projected on each of the first and second materials.

[c32] An electron beam physical vapor deposition process according to claim 30, wherein the generating means projects a first electron beam on the first material and a second electron beam on the second material.

[c33] An electron beam physical vapor deposition process according to claim 30, wherein the second material is in the form of an ingot.

[c34] An electron beam physical vapor deposition process according to claim 30, wherein the second material is in the form of a wire.